DEPARTMENT OF THE INTERIOR, CANADA

HON. W. J. ROCHE, Minister; W. W. CORY, Deputy Minister.

E. F. DRAKE, Superintendent of Irrigation.

IRRIGATION SERIES

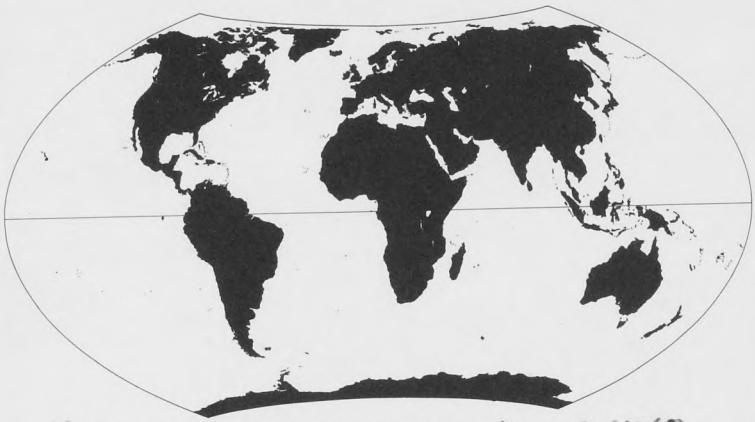
BULLETIN NO. 2.

ALFALFA CULTURE

OTTAWA

GOVERNMENT PRINTING BUREAU

1914



Stacking Second Cutting of Alfalfa.

DEPARTMENT OF THE INTERIOR, CANADA

Hon. W. J. Roche, Minister; W. W. Cory, Deputy Minister.

E. F. Drake, Superintendent of Irrigation.

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64147—2

DEPARTMENT OF THE INTERIOR—IRRIGATION OFFICE.

BULLETIN No. 2.

ALFALFA CULTURE

APPROVED METHODS

By P. J. Jennings, Assoc. Mem. Can. Soc. C.E.; Assoc. Mem. Am. Soc. C.E.

RESULTS OF EXPERIMENTS IN GROWING.

By R. J. Burley, B.A.Sc., Assoc. Mem. Can. C.E.

EXPLANATION OF INDEX MAP.

GREAT POSSIBILITIES OF OUR IRRIGATED LANDS

By W. H. Fairfield, M.S., Superintendent Dominion Experimental Station for Southern Alberta.

DEPARTMENT OF THE INTERIOR.

IRRIGATION OFFICE.

BULLETIN No. 2.

The subject matter of this bulletin dealing with the growth of alfalfa in Alberta and Saskatchewan, has been carefully prepared in an endeavour to give to alfalfa growers in Western Canada true information, which will be applicable to the local conditions met with.

It has been the endeavour to avoid any statements based merely on theoretical deductions, and instead, to make only such statements as are based on actual experiences which have been noted by the writers.

Many irrigation farmers still have some doubts as to whether alfalfa is a proven crop in Western Canada, and for the benefit of these persons the "Index map to alfalfa fields" has been prepared, which indicates clearly those areas concerning which sufficiently definite information has been gained to show alfalfa a proven crop.

F. H. PETERS,
Commissioner of Irrigation and Chief Engineer.

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APPROVED METHODS OF ALFALFA CULTURE

By P. J. Jennings.

ALFALFA.

There is but little doubt that the majority of the licensed water users, in Alberta and Saskatchewan, have some land which is suitable for the growing of alfalfa. Those who have, and have not already started growing this wonderful forage plant, will it is hoped, after reading these notes, prepare a piece of their irrigable land and start to establish an alfalfa field. With a little care in the selection and preparation of the land to be converted into a valuable crop producing area, together with a study of the notes given herein, the writer feels confident that success will follow any such well directed efforts.

Preparation of the Land.

The land to be seeded to alfalfa should be ploughed at least from six to eight inches deep; this prepares a sort of storage reservoir for the moisture and it is advisable to plough one season ahead and thoroughly work up the soil after every rain; this will prepare a good seed bed and almost assure a crop if a good season follows.

In the spring the land should be harrowed and disced, and also after seeding. Care should also be taken to ensure the thorough eradication of the prairie grasses. Practically the only way to do this is to take summer-fallowed land and thoroughly prepare it for the seed bed by discing and harrowing. Weeds are a great menace to a young alfalfa crop and their presence will greatly retard the growth of the young plants. It is therefore essential to begin with land well prepared and free from weeds; this condition can be obtained by the above methods or by sowing immediately after a hoed crop, such as potatoes.

Seeding.

Seeding can be done with a drill in the same manner as for grain, but should not be put in deeper than two inches. If sown broadcast the land should be dragged once or twice after seeding with a light harrow.

For a hay crop, on irrigated land, from twelve to twenty pounds of seed per acre will generally be found satisfactory. On dry land, for hay, from ten to twelve pounds per acre will generally suffice. Opinions differ greatly as to the best amount of seed to use per acre, but the above may be taken as a fair average of the opinions expressed.

Before purchasing a large quantity of seed a farmer should first obtain a sample and test it for germination. A good sample should show at least ninety per cent of good germinable seeds. By this means the value of the seed is known and the quantity to be seeded per acre can be adjusted accordingly.

A nurse crop should never be used in these provinces as alfalfa usually needs all the moisture and sunshine it can get.

It is advisable to seed as early in May as possible, and not later than the middle of June, exact dates depending upon location. In the Calgary district and eastward along the Bow river, from the middle to the end of May would be safer.

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There are many varieties of seed but mention will only be made of those which experience has proved most suited to northern conditions. The greatest success has so far been achieved with the *Grimm* and *Turkestan* varieties which are hardier and seem to withstand the peculiar, trying winter conditions better than any other.

One irrigator in Saskatchewan has such faith in Turkestan seed that he is sowing five tons on his irrigated lands this year. He has already 125 acres in crop.

Some farmers find they get the greatest success from double seeding, *i.e.*, sowing half the seed one way and the other half crosswise. By this means it is claimed a more even crop is obtained as any spots missed one way will be seeded the other.

It is very advantageous to level the land off as much as possible with a land leveller; this helps considerably when cutting, for the more level the land the closer may the crop be cut.

Care should be taken to procure the best and cleanest seed and it is a benefit to get seed from northern-grown alfalfa if possible.

Soils.

Alfalfa being a deep-rooted plant it is absolutely necessary to select land that is well drained. Land which has water underlying it at from 4 to 5 feet from the surface is not suitable. Land with a hard-pan subsoil beneath a shallow layer of good soil from eighteen inches to two feet in depth is altogether unsuited for alfalfa.

It is often and truly said that alfalfa will not grow under conditions where it has "wet feet." The ideal conditions for the crop is a sandy loam soil with a deep, loose, alluvial subsoil. Such conditions are often met with in the valleys of most of the larger rivers of Alberta and Saskatchewan. The initial success of the crop will depend upon the surface or top soil conditions, but its ultimate establishment and success will depend upon the subsoil conditions.

From the above it will be seen that it will be energy well expended if the farmer, contemplating trying a few acres of this crop, first of all makes a few soil tests. This can be readily done by means of an ordinary post hole digger, and a depth of four to five feet tested out. From these trial holes the farmer can get a good idea of the subsoil conditions and also ascertain whether or not the water table is dangerously near the surface.

Early Care of the Young Plant.

The first time the crop gets from eight to ten inches high it should be cut, and in dry season it would be well to leave it on the ground to act as a mulch. Blooms should never be allowed to appear in the crops the first year.

The critical time with the young plants is during the first few months, when a hard frost will kill them off. After the first year, however, and when the tap roots get down into the soil, as they do very soon, there is little or no danger of killing from frost.

The young alfalfa plant is very tender and until it becomes very well established it should be treated very carefully. Frequent cuttings are, however, necessary in order to encourage root development and general growth. The crop should never be cut too close to the crown of the plant.

Stock should not be allowed to feed down the crop the first season. Before winter sets in the crop should be cut at least five or six inches above the ground as this is conducive to the formation of a good blanket of snow and helps to prevent the land being wind swept and bared during the coldest weather.

It is not advisable to allow stock to feed down a crop too closely at any time, because the tramping down and hardening of the surface soil will slowly and surely kill out the plants.

Fall Irrigation, Alfalfa.

Irrigation.

Unless a very dry season is encountered irrigation is not recommended during the first year, the reason being that it is desirable to get the plant to root down deeply by itself, the application of moisture not tending to encourage deep rooting.

The second year irrigation should be applied with greater freedom, but care must be exercised so that the ground is not too moist when the first crop is nearly ready for cutting. Too much moisture at this stage is harmful, as it prevents good curing. In an average year it would not be necessary to irrigate for the first cutting, but immediately the first crop is cut, water should be judiciously applied.

In the Lethbridge district of Alberta it has been proved by experience that water applied to well established alfalfa, in the fall of the year, has been very successful, the reason being that by having the soil well saturated in the fall, there is no need to apply any water at all in the spring of the year; in fact the first cutting can be taken off before any water need be applied. If the field is irrigated in the spring, there is a danger that, with the heavy rains which are usually expected in May and June, the soil may become over saturated and this condition will retard rather than induce growth at this period of the year.

A crop that is suffering from want of moisture will turn a dark, lustreless green colour, and when suffering from excess of water due to bad drainage it will turn a yellowish colour. It is advisable whenever a crop appears to be suffering from either cause or looks at all sickly, to cut it down and let it have a fresh start.

It is essential that the alfalfa plant should have, as it were, room to breathe; this fact has been demonstrated time and again. A field may be put down to alfalfa and apparently all does well, but a test comes in a spell of wet weather and the result is soon apparent in the crop in the low land where the soil is heavier and there is no drainage; the alfalfa turns yellow because it is smothered and cannot breathe. But a contrast is seen on the high, dry land where, perhaps, the soil is light or gravelly, the plant has room, and it takes all the benefit from the moisture. It therefore follows that it is not good policy to seed alfalfa on heavy clay or alkali land.

Inoculation.

Considerable doubt seems to exist in the minds of the farmers in the North-western Provinces, as to the necessity for inoculation. Experience seems to prove that inoculation is necessary. A farmer recently stated to the writer that he had a good stand of alfalfa which he had originally sown on virgin prairie land. The plants were all doing well until the second summer, when, for no apparent reason, they began to die off and he wished to know if this was due to the fact that he had not inoculated the soil first. Probably this was the cause and he was advised to procure some inoculated soil at once and sprinkle it over his land, using from two to three hundred pounds to the acre. A crop seldom, if ever, shows the lack of inoculation the first year, but the second year it will surely be apparent. One of the processes of inoculation will therefore have to be adopted in order to establish the field. Of the two methods, the nitro-culture method and the earth method, there is little doubt that the latter is the simpler and better. In order to use the nitro-culture method, germs should be secured from some agricultural college and sprinkled over the seed. The treatment is very similar to that very commonly used on grain for smut. It is a good plan for a farmer who intends growing alfalfa to establish a few acres first, and then to use this patch for the inoculation of the larger acres to be treated by the earth method.

Cutting the Crop.

The crop should be cut immediately the first bloom appears and the cutting should be rushed to completion. With alfalfa when the crop is ready for cutting

it is all ready at once and delay is expensive, as, if it is left standing, it will soon begin to lose its leaves, the most nutritious part of the plant. Delay also tends to increase the coarseness of the stalk or vine of the plant, rendering it less nutritious.

A few hours after cutting (four or five) it should be raked up into windrows, then cocked up into small piles and left in this way to thoroughly dry out. Just before hauling away it should be turned over from the bottom to ensure that it is all thoroughly dry. The piles should not be left too long on one spot or they will smother the plants beneath.

Alfalfa on Dry Land.

It is often stated that alfalfa grown on dry land is hardier, and the forage more nutritious than alfalfa grown on irrigated land. The reasons given are that alfalfa on dry land is finer in texture, cures better and is more digestible, whereas alfalfa grown on irrigated land is coarser, has a heavier stalk, containing more wood, and consequently is less digestible. Farmers on irrigated land will not admit this; their experience they claim demonstrates the fact that by cutting the crop immediately the first blooms appear, they can obtain the fine fibre hay which is so much to be desired, owing to its greater nutritive properties.

In certain parts of the provinces of Alberta and Saskatchewan where a more generous rainfall is experienced than in what is known as the "dry belt," alfalfa has been grown with a certain degree of success. The tonnage per acre produced will not be nearly so great as on the irrigated land, but in its relation to other forage crops on dry land there is little doubt that alfalfa will give a greater tonnage per acre.

On well prepared dry land in a district with a rainfall sufficient for the usual crops grown in these provinces, it has been established beyond doubt, that, providing the proper seed is used, alfalfa will grow and good returns will be obtained. It should, however, be remembered that all the details of culture mentioned above will apply equally to the dry land conditions. At least one good cutting will be secured from a crop on suitable dry land, and unless good summer rains come after this first crop is removed the second or third crop will probably be a negligible quantity.

Value of Alfalfa to the Soil.

Alfalfa not only restores the nitrogen so necessary to the soil, but after it has been grown for a few years it is found that the soil becomes richer than it was before alfalfa was sown.

There are several known cases where alfalfa has been grown on the same land for fifty years.

The average yield for an established field of alfalfa on irrigated land is from three and one-half to four tons per acre per annum.

Those who have irrigible land and are thinking of growing this wonderful plant should carefully read over the following short account of the methods considered most suited to the successful cultivation of this plant, gathered from a collection of reports from actual irrigators in Alberta and Saskatchewan, and prefaced "Results of Experiences in Growing Alfalfa."

RESULTS OF EXPERIENCES IN GROWING ALFALFA.

By R. J. Burley.

In approaching the question of the preparation of a bulletin on alfalfa some diffidence is felt in taking up a subject which naturally lies more in the province of the agriculturalist than of the irrigation engineer, so that the writer has endeavoured to give only the results of actual experiences which have come under his observation and no attempt will be made to lay down arbitrary rules for the best methods to be used either in the cultivation or handling of this crop.

While the growing of alfalfa in Western Canada, with the exception of the Lethbridge district, may be said to be still in the experimental stage, enough has been done to demonstrate the possibility of raising this crop on irrigated land, at least, and upon unirrigated land in favourable locations. The acreage under crop is still small, but just so soon as the farmer and rancher can be brought to realize the value of it from the standpoint of both a forage plant and a fertilizer and can be shown beyond doubt that it can be successfully grown, there is no doubt that the acreage will increase by leaps and bounds. The object of this short paper is to show what has already been done and to give a short account of experiences of those who have made a success of this crop.

Alfalfa in Northern Montana.

Along the valleys of the main stream and tributaries of Milk river in Montana the climatic conditions are very similar to those of Western Canada, but the growing of alfalfa is probably somewhat further advanced than it is here. It is, however, still easy to trace the various stages through which the raising of this crop progresses before it can be said to be on a commercial basis and in the districts settled within the last few years the conditions are almost exactly those found in our own newly settled districts, while in the older communities the conditions are similar to those in the Lethbridge district.

In the eastern Milk river valley and along the eastern tributaries little or no alfalfa is seen until Malta is reached. From this point to Savoy there are a number of small fields of which the majority are not in first-class shape and, from appearances, are not yielding a large crop. From Harlem to Chinook, however, is an old settled district, and a large area of the valley here is seeded down to alfalfa. It is here that probably the greatest success possible has been made of this crop, and from a mere inspection of the fields it can be seen that alfalfa once established is very hardy, and needs little or no attention to ensure a good yield under irrigation. The plants here have spread over the road allowances and along the fences and appear to flourish under most adverse circumstances, while sweet clover, a plant closely allied to alfalfa, forms hedges six to eight feet high along the roadsides. On a few farms this crop is grown for hay or ensilage and the growth was enormous by the first part of August.

Following up this valley from east to west it is most noticeable that under identical conditions, so far as soil and climate are concerned, there is a marked difference in the success of alfalfa and apparently the only explanation which fits the case is the

fact that alfalfa and sweet clover have been so long established in the western portion of the valley, and that the "nitrobacters" have been carried by irrigation water, wind and other means until all the soil in these particular districts is thoroughly inoculated. Farther east the conditions are similar to those in Western Canada, and until the farmers begin to use inoculation, or until the land becomes inoculated through the slow spreading of the bacteria, it is doubtful whether the crop will be a great success there.

Preparation of the Land.

The best results have been obtained from land which has been ploughed to a depth of six to eight inches, well disced and harrowed and planted after a hoed crop, or summer-fallowed the season before the alfalfa is sown. Such a field has been so thoroughly cultivated that the weeds have been eradicated and the prairie grasses killed, thus giving the young alfalfa plants the full benefit of the natural soil richness and moisture in the first year. After the crop is sufficiently advanced to produce hay there is little danger of undesirable plant growth, as there are practically no weeds which can long withstand the drastic treatment of being cut back twice a year. In reviewing the experiences of a large number of successful alfalfa growers it has been found that in practically every case some such preparation as this was made, and there is no doubt that in a good many cases where failure has been met with, are due to a lack of careful preparation of the land previous to the seeding down to alfalfa.

Inoculation.

With regard to inoculation there appears to be a considerable difference of opinion amongst the settlers from alfalfa growing districts in the States, as a large number claim that it is unnecessary while others believe that success is impossible unless it is done. The former belief is probably due to the fact that many of these settlers come from districts where alfalfa has been established for many years, and where the bacteria are carried by the wind, irrigation water, &c., from the older fields to the ones newly sown. From observations made in the field there appears to be no doubt that it is necessary to inoculate either by means of the nitrobacter culture or with earth from a well established alfalfa field if the crop is to be a success within a reasonable period, although it would appear that the crop will establish itself if given sufficient time.

The experience of Mr. Joseph Dixon, of Maple Creek, well illustrates this point and is given here for that purpose. He planted some ten to twelve acres during the latter part of May, 1910, on well cultivated river bottom land, without inoculation. During that season, which was very dry, the crop grew well, reaching a height of from twelve to fifteen inches, when it was cut late in August and the hay taken off the ground. The next season, although very wet the crop did not thrive, appearing yellow and sickly except in some few spots through the field where there was a marked difference in the colour and size of the plants. These spots were spreading during the summer, and lines of the stronger growth could be noted radiating from them, due it would appear to the multiplication of the "nitrobacter" in the soil. The danger in such a case would appear to be that the weaker plants would be winter killed before the inoculation had spread over the whole field, thus leaving bare patches, and causing a light yield.

Owing to the difficulty in obtaining earth from established alfalfa fields in a newly settled district it would appear advisable for the irrigator to treat enough seed with the nitrobacter culture to plant, say one acre, and then to use earth from the field so established to inoculate any further land he wishes to grow this crop on. While this method is still more or less in an experimental stage, especially in the preparation and handling of the cultures, there is no doubt that, if care is taken to

properly treat the seed in accordance with the instructions issued by the Provincial Agricultural Departments, good results can be obtained, and as it is the only method practically available to the majority of farmers in newly settled districts on account of the expense in importing earth from old fields several hundred miles away, it is recommended for the establishment of small areas.

This method of inoculation was tried by Doctor Allison Smith in township 14, range 3, west of the 4th meridian some years ago, when he planted about one acre, half with inoculated seed and half without inoculation, and it was found that while the latter was almost a complete failure in the second year, the former made satisfactory progress, and the earth from it was used for the inoculation of a further twenty acres. Dr. Smith had some sixty-five acres in this crop by the spring of 1912, and was then preparing to put in a further hundred acres.

Mr. W. T. Smith, whose ranch is in the South Saskatchewan river valley in township 23, range 27, west of the 3rd meridian, last year planted one hundred and twenty acres, using the culture method of inoculation, and reports it as successful so far. He has such faith in the possibilities of alfalfa growing that he expects to plant five tons of seed this season, using the same method as last year.

Irrigation.

It is probably safe to say that alfalfa is primarily an irrigated crop in the southern parts of the prairie provinces, for while there is no doubt that it will grow on dry land the yield is so much increased by irrigation, that it would appear almost necessary to the successful raising of this plant to apply water at least once during the season.

As to the proper time to apply water all authorities appear to agree that alfalfa should be irrigated immediately after the removal of the first and second cuttings and Mr. W. H. Fairfield, superintendent of the experimental station at Lethbridge, Professor Elliott of Lacombe, and others who have had many years' experience with the cultivation of this crop, strongly recommend fall irrigation so that the water applied will be reservoired in the soil and give the plants an early start in the spring. In this connection it is interesting to note the experience of Messrs. Enright and Strong. They had several acres of alfalfa established and growing well on their ranch at East End and were taking off two cuttings per annum, when in 1907, the foreman irrigated about half of it late in the fall before the water was turned out of the ditches. In the spring this portion was found to be dead while the rest of the crop did well during that season. That fall, however, the new foreman, during the absence of the owners irrigated the remaining tract and this was also found winter killed, and the following spring upon examination, it was found that the top roots were broken a short distance below the surface of the ground. This is explained by the theory that the water-soaked surface earth was heaved by frost during the winter, snapping the top roots and thus killing the plants. It is possible, however, that there may have been other factors entering into the matter of which the owners were ignorant, but they are firmly convinced that fall irrigation is an unwise procedure in so far as alfalfa is concerned.

With regard to spring irrigation it is considered that this is usually inadvisable if it can be avoided, as it tends to prevent the soil warming up and thus retards plant growth. These are cases, however, where it is necessary to irrigate in the spring or not at all, and in this connection it may be said that fair success has been attained by Mr. Dan Drinnan of Walsh, Alberta. He seeded down a small plot in 1910, and the only irrigation available is from MacKay creek which usually flows only a few weeks in spring. With this water supply he has succeeded in taking off two cuttings per season, the first of two tons per acre and the second one ton. In the same valley and under similar conditions, excepting that land is too high to irrigate, Mr. James Hargrave seeded down sixteen acres in 1911 and now gets an average yield of only one-half ton per acre.

Where water is available at all times, however, the best yields are assured by the the application of water to a depth of four to ten inches, depending on the permeability of the soil, as soon as the hay is removed after each cutting.

Another source of water supply for the plants is by means of sub-irrigation where the water from a creek spreads through a previous subsoil. This condition is frequently found in creek valleys where the two or three feet of loam is underlain with a gravel stratum which is supplied with water from the creek. Under such conditions a number of fields have been observed where highly satisfactory results have been obtained and where the quality and quantity of the yield are quite as good as in any irrigated district.

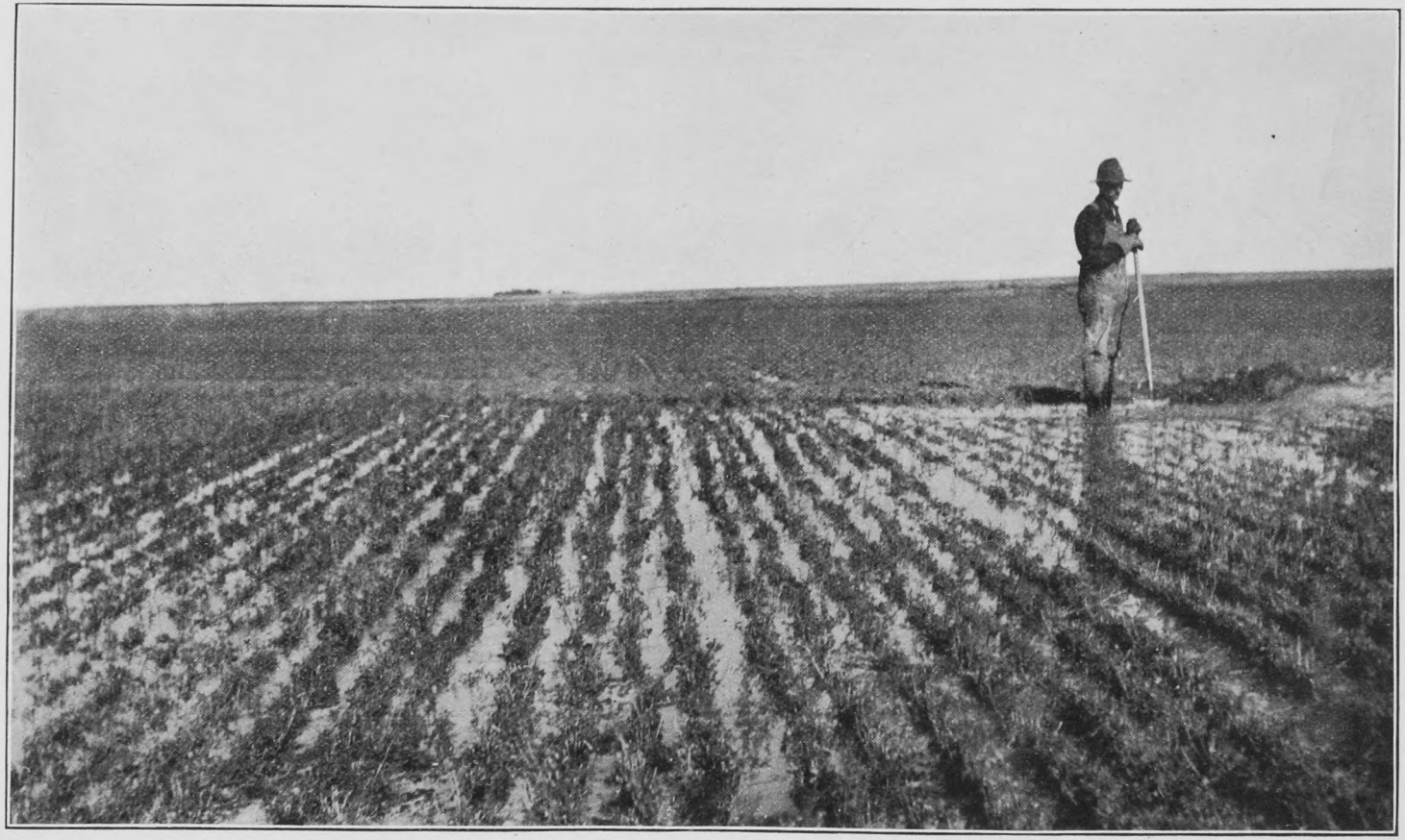
Number of Cuttings and Yield.

In the majority of cases alfalfa is only cut twice per season in this country and under favourable conditions yields from three to seven tons per acre in these two cuttings.

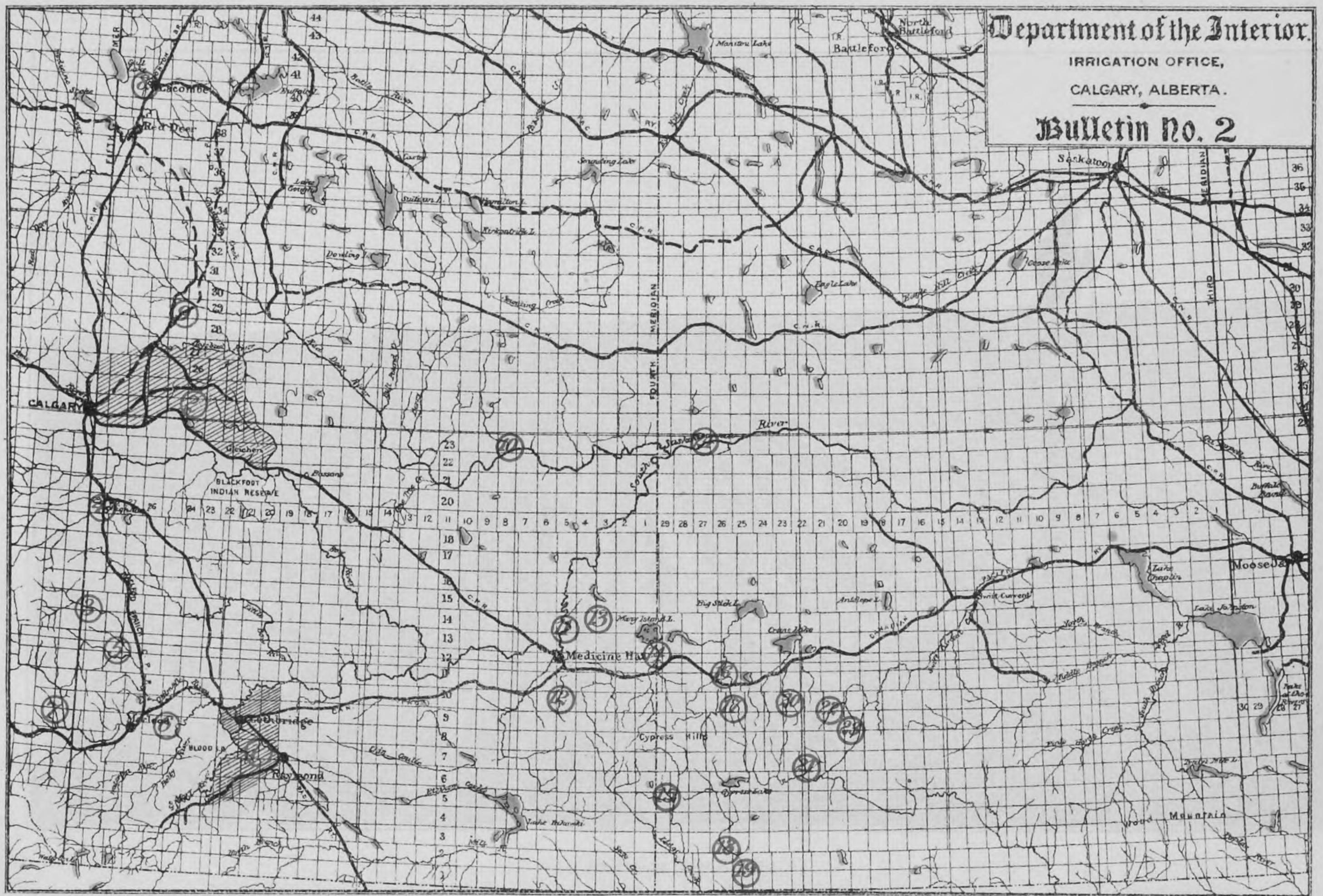
At the Experimental Station, Lethbridge, three cuttings have been made but the yield has not been materially increased, although possibly the quality of the hay is a little finer.

It is doubtful, however, whether the slight advantage gained repays the extra work, and it is understood that the practice has been discontinued partially from this reason and partially because the late cutting is likely to injure the field if winter sets in very early.

In conclusion it may be said that alfalfa is now grown to some extent from Fort Vermillion in the north to the international boundary, and from the Rocky mountains to the eastern boundary of Saskatchewan, and more interest is being evinced each year in its growth both from the standpoint of its value as a forage crop and as a fertilizer to be used in crop rotation. It is probable that its cultivation will be extended greatly within the next few years, more especially amongst irrigators who have well drained land so well suited to its growth. As a comparatively large number of settlers in the irrigated districts of Alberta and Saskatchewan have come from alfalfa-growing districts in the United States, they do not need to be told of its value as a forage crop, and owing to their experience there is no doubt that its cultivation will be extensively carried on, as their example will teach others the advantages of this best of all forage crops, as soon as experiments have shown the best methods to be followed under the somewhat different climatological conditions met with in this country.



Irrigating New Alfalfa.



Department of the Interior.
IRRIGATION OFFICE,
CALGARY, ALBERTA.
Bulletin No. 2
Saskatoon
North Battleford
Battleford
Manitou Lake
Lacombe
Red Deer
Calgary
Blackfoot Indian Reserve
Medicine Hat
Lethbridge
Macleod
Raymond
Moose Jaw
Swift Current
Cypress Hills
Lake Chaplin
Lake Johnston
Wood Mountain
South Saskatchewan River
Fourth Meridian
Third Meridian
Fifth Meridian
Battle River
Red Deer River
Sounding Lake
Sullivan L.
Hamilton L.
Kirkpatrick L.
Dowling L.
Sounding Creek
Goose Lake
Eagle Lake
Eagle Hill Creek
Big Stick L.
Crane Lake
Antelope L.
Many Island L.
Cypress Lake
Lake Pakowki
Milk River
Blood I.R.
Gleichen
Bassano
C.P.R.
C.N.R.
Compiled and Drawn in Irrigation Office, Calgary

INDEX MAP TO ALFALFA FIELDS.

Alfalfa growing in Western Canada, especially under irrigation, has been strongly advocated by many speakers throughout Alberta, Saskatchewan and British Columbia and many articles upon this subject have been printed and circulated both in the newspapers and in pamphlet form, but so far as the writer is aware, no attempt has ever been made to show graphically what has already been done in the cultivation of this crop. The accompanying map and concise description of the experiences of the farmers and ranchers throughout the two prairie provinces have been prepared with this object in view, and it is hoped that they will bring home to the reader the fact that alfalfa has been proved, beyond doubt, to be the best forage crop in this as well as other countries.

A glance at the map indicates at once the wide distribution of this crop and a perusal of the accompanying description should convince the most sceptical that alfalfa not only can be, but has been successfully grown under irrigation at least, over practically all the southern parts of the two provinces, and from the yields obtained it is evident that no other forage crop can compare with it in productiveness.

In the United States it is often said that as soon as it can be proven that alfalfa can be successfully grown, land values become established at a high level, and the same will certainly be true here as soon as our farmers and ranchers realize the value of this crop, and the sooner this realization comes the sooner will the value of our agricultural lands assume its proper level.

No. 1.—In the Lethbridge district the growing of alfalfa under irrigation has been on a commercial basis for several years and there are at present some 10,000 acres seeded down to this crop. This is undoubtedly the greatest alfalfa-growing district of Western Canada at the present time and no question can arise as to its success here where irrigation is available. This success is due principally to the efforts of Mr. W. H. Fairfield, Superintendent of the Dominion Experimental Farm at Lethbridge, who has constantly advocated the growth of this plant since his arrival in the country, and who has proven beyond a doubt the value of it to the irrigated farm.

The crop here yields from four to six tons per acre, and is cut two or three times per season. The new fields are inoculated by earth from old fields, and the crop is irrigated after each cutting, fall irrigation having been found most advantageous.

No. 2.—On the western section of the Canadian Pacific Railway Company's irrigated tract, alfalfa growing is still somewhat in the experimental stage, as it has only been grown to a considerable extent for the past few years. Enough has been done, however, to demonstrate beyond doubt that it can be grown successfully, and there are now some seven hundred and fifty acres under this crop. It is probable that most of the failures in this district have been due to the lack of inoculation or to the seed used being of the wrong variety, possibly imported from the warmer portions of the United States.

No. 3.—Mr. George Lane, one of Alberta's leading ranchers, has been growing alfalfa successfully under irrigation for some ten years in the Porcupine Hills and now has one hundred and seventy-five acres in this crop, and is putting in more every year. Two crops per year are taken off, yielding three and one-half tons per acre.

No. 4.—At High River Mr. J. W. McLaughlin planted eight acres with Montana seed in 1911, and last season took off two tons per acre in two cuttings. He has found that fall irrigation did not give as good results as a top dressing of manure before winter comes on.

No. 5.—Mr. J. W. Stevenson on Trout creek irrigates about twenty-five acres of alfalfa, cutting two good crops per season.

No. 6.—Mr. Robert Patterson, M.P.P., of Macleod, sowed five acres in 1909, using ten pounds of seed per acre, and got a splendid stand. Unfortunately the stock were allowed to run on it during the first two years and damaged it so badly that it became very patchy, and the returns have not been good.

No. 7.—On Todd creek Mr. C. W. S. Elton has six and one-half acres in alfalfa, which was irrigated last season but not the year before. The yield when irrigated once and cut once was nine and one-half tons, while without irrigation the total yield was only one and one-half tons.

No. 8.—Extensive experiments have been carried on at the Dominion Experimental Farm, Lacombe, with different varieties of seed and it has been found that serious winter killing has taken place in all varieties but the Grimm and Turkestan. These have however proven successful and ninety per cent of the plants of these varieties have withstood the winters.

No. 9.—Mr. J. D. Patterson, of Acme, sowed six acres in June, 1912, without inoculation but under irrigation. The yield last season was only one-half ton per acre. This crop was watered in the beginning of May for six days by flooding.

No. 10.—Mr. J. R. Hallam seeded five acres in June, 1900, half with a nurse crop and half without, using earth for inoculation. He used fifteen pounds of seed per acre, and irrigated the field about the 1st of June, 20th of June and end of July. The yield has been very good, as last year he took five loads per acre off this piece of ground. The land had been in potatoes before sowing the alfalfa.

No. 11.—North of Medicine Hat in the South Saskatchewan valley Mr. James Rae put in fifteen acres last season without inoculation on ground that had been previously in potatoes. He had a good stand last fall but is unable to say whether the crop will be a success or not as yet. He had fifteen acres in for six years previously which were sown with inoculated earth, and this did well but was ploughed up, and planted to potatoes and corn last year.

No. 12.—Messrs. Starks and Burton, south of Medicine Hat, have forty-two acres under this crop, which are irrigated by a private scheme. Twelve acres of this area have been in four years, and the yield from this portion is six tons per acre in two cuttings. The remaining thirty acres were put in last season and were not cut.

No. 13.—Doctor Allison Smith, of Medicine Hat, has successfully grown alfalfa on a commercial scale for the last five years and takes five tons per acre off the older portion in two cuttings each season and four tons on land more recently seeded. The land is irrigated each year from a reservoir in a coulee and at present there are over sixty-five acres in this crop.

No. 14.—On the large flat in McKay creek valley north of Walsh, Mr. D. Drinnan has had an experimental crop in for the past few years, and with spring flood irrigation only takes off three tons per acre in two cuttings. This land is of a class usually considered unsuitable for alfalfa as it is composed of a heavy clay silt, and no indications of a good under-drainage can be seen.

No. 15.—On Middle creek south of the Cypress Hills, Mr. W. X. Wright planted ten acres on a heavy clay soil, in May, 1912. The ground after breaking was sown to

peas the first year, oats the second and alfalfa the third. Owing to the oats shelling out during a heavy storm these acted as a nurse crop which did not appear in any way to injure the alfalfa. The seed, which was from northern Montana, was inoculated by the culture method and has apparently become well established. Unfortunately, owing to the fact that this field was seeded on a very windy day, not much more than half of it was seeded, but it nevertheless yielded twenty tons of hay in two cuttings in July and September of last year. This land was irrigated in early April and the middle of July, 1913. Mr. Wright is fully satisfied that alfalfa is a success here and intends to gradually increase the area until he has six hundred acres under this crop.

No. 16.—Experiments of Mr. Joseph Dixon mentioned in main report.

No. 17.—Mr. T. A. Drury planted one acre of alfalfa near the junction of the east and west branches of Maple creek in 1912 and last season took off the first crop early in July, the yield being at least two tons. By the 8th of August the plants again averaged over two feet in height and were very thick and even. This land is sub-irrigated and very little water over the surface suffices.

No. 18.—Mr. Earl Nash has had ten acres under his irrigation scheme for some years, and in 1912 took eighteen hundred pounds of seed off four acres and about three tons of hay per acre from the remaining six acres. He cuts the crop twice a year and irrigates only once after the first crop.

No. 19.—Mr. H. J. Badger on section 16, township 2, range 26, west of the 3rd meridian, has had a small area under alfalfa for some eight years, and has been very successful. He irrigates each season after cutting.

No. 20.—Mr. A. McCarthy planted about four acres in alfalfa, some ten or eleven years ago and had great success with it without irrigation. The methods used in the preparation of the seed and land in this case are not known to the writer, but five or six years ago Mr. McCarthy sowed some twenty acres more, inoculating with earth from the original four acres. This has also been very successful and two crops are taken off each year after which the tract is used for pasture.

It should be noted, however, that while this land is not irrigated the conditions are such as to be ideal for the growth of alfalfa as it is situated in a flat in the valley of Bear creek, and the surface soil one and one-half to two feet deep, is underlain with a stratum of gravel, which is propably kept full of water from the creek, so that the long tap roots reach permanent moisture.

No. 21.—Mr. Spencer Pearce has had three-quarters of an acre seeded down since early May, 1909, and has cut hay on it each year since, averaging about four tons per acre. This plot was seeded without inoculation of any kind, as the wild vetch is indigenous on this land. In the season of 1910, the second year, the yield was poor as there was not enough water in the creek for irrigation. The crop was cut once in 1909 and 1910 and twice per season since.

No. 22.—Mr. F. T. White has sown alfalfa in rows about two feet apart with the intention of growing seed. The crop was in good shape last season in August.

No. 23.—Messrs. Stearns Bros., on Jones' coulee, have about ten acres seeded down from which about twenty loads were obtained. Part of the field was put in four years ago, and part last season with between twelve and fourteen pounds of inoculated seed per acre. This crop is well established and successful.

No. 24.—Some eighty or ninety miles north of Maple Creek in the valley of the Saskatchewan river, Mr. W. T. Smith is preparing what will probably be one of the largest alfalfa fields in the west. Last season he sowed one hundred and twenty-five acres and this year is preparing to use a further five tons of seed. He has used the culture method of inoculation on the first fields and up to date the crop has proven very successful and is coming up this spring (1914) in good shape.

Cutting Alfalfa.

"GREAT POSSIBILITIES OF OUR IRRIGATED LANDS."

By W. H. Fairfield, M.S.

Superintendent Dominion Experiment Station of Southern Alberta.

The following is a reproduction from the Lethbridge Herald of 9th October, 1913, of an address given by Mr. Fairfield before the Lethbridge Board of Trade on the above date. Through courtesy of Mr. Fairfield the address is reprinted in full.

"In the vicinity of Lethbridge there are 80,000 acres of land now being irrigated. The C.P.R. have about half as much more ready to be put on the market. How many of you have much of a conception of the potential wealth contained therein, which so far has been practically untouched? Gentlemen, the value of our coal deposits hereabouts, great though they be, must take second place.

"How many of you present realize what it is possible for this land to produce; in fact, how many of you realize how fortunate we are to have this irrigated land? Do not some of you think of the necessity of irrigation as somewhat of a misfortune? Are there not many of you that are like the average Ontario farmer, who says, after he has looked over the district round here: 'What a wonderful country this would be if it only had more rain?'

"I shall endeavour, in the few minutes that I have, to point out some of the advantages that we have in being surrounded by this irrigated land, with its abundant water supply.

"A farmer on irrigated land has an absolute insurance against drought, that greatest of bugbears to the average farmer in a humid district, provided always, that he is sufficiently forehanded to be prepared to use the water intelligently and faithfully at the proper time. The damage to crops while they are being harvested, particularly in the case of hay, is no small item in a district that depends entirely on the rainfall. The man on irrigated land suffers less from this cause.

"Irrigation is not an experiment, as the prosperous and wealthy agricultural communities in the Western States to the south of us, where irrigation has been practised for several decades, amply testify. Some of you may think that the conditions are not entirely comparable on account of the large amount of fruit that is raised in the warmer latitudes. As an actual fact, however, fruit is raised on but a small fraction of the total area of irrigated land in the United States, most of it is devoted to field crops. I am not positive of my figures, but if I am not mistaken 65 per cent of all the irrigated lands in the States is devoted to alfalfa growing, according to the United States census reports.

SMALL HOLDINGS IMPERATIVE.

"Now, this hay is not baled and shipped to Chicago and New York, as our wheat is shipped to Fort William and Montreal, but, it being fed on the farm, makes possible vast dairy interests and the fattening of scores of thousands of cattle and sheep. The manure left by this stock enriches the land so that the soil so prodigally supplied by nature with fertility is gradually improved. As an example, I can cite something in my own experience: In a little wheat centre in which I lived when a boy in North Colorado, forty bushels to the acre was considered a maximum crop; now in the same

district fifty to sixty bushels to the acre is not particularly uncommon. The fields are smaller, no doubt, as more intensive methods are followed, but the reason for the increase in the yields of their grain fields is due to the fact that the fertility of their farms have been increased by the raising of alfalfa, and the manure from the stock it has been fed to.

"And right here I want to point out that farming under irrigation must be intensive before the highest results can be reached. It is for this reason, no doubt, that irrigated districts develop more slowly than do new districts under humid conditions. Irrigation does not lend itself well to extensive operations. Small holdings are imperative. We will not see the highest development in our irrigated districts till the average farm unit is a quarter section or even less.

"Nine-tenths of our farmers are trying to irrigate too much—with the result that it is impossible for them to keep up with their work. Their crops are most uneven, because some parts are not irrigated at all, while others are injured by too much water. This is not because we have poor farmers, as I have heard some of you present assert, but because they are over ambitious, and are attempting too much; time will, no doubt, correct this, but anything you can do gentlemen, to encourage our farmers to farm less and do it better will be a distinct benefit to them and a Godsend to our community. The advantages to Lethbridge of an increased population is self-evident. The average farm unit in the irrigation projects to the south of us is much nearer 80 acres than it is 160 acres, but if our average farms were reduced to even 160 acres, we would witness a vast improvement.

WHAT LAND CAN PRODUCE.

"A word now as to what it is possible for us to produce on our irrigated land, when it is farmed intensively. First, speaking of alfalfa, for it will always be a most important crop, for two reasons: first, because it grows so abundantly, for I am willing to assert, without fear of contradiction, that we can produce more alfalfa per acre on irrigated lands here, than can be produced anywhere in the Dominion, with the possible exception of irrigated districts to the west of us in British Columbia. It is a well known fact that, although it is a profitable crop in many localities, in the east it thrives best under irrigation, where it receives ample moisture accompanied by a maximum amount of sunshine. The second reason for its importance is that it enriches the soil, making it possible to raise bumper crops of all kinds when it is ploughed up. The average yield of field-cured alfalfa hay on the experimental station during the past five seasons has been between five and six tons per acre. Say, that the average farmer only raises two and a half tons per acre, and placing its value for feeding purposes at $10 per ton—a gross return of $25 per acre is realized. It would take a 35-bushel crop of 70-cent wheat to produce this; and, mark you, this is produced year after year, with no ploughing or seeding, and no idle years intervening for summer-fallowing. With intelligent feeding no difficulty should be experienced in realizing over $10 per ton. On the station we have fed lambs for the past two winters, and realized about $20 per ton for choice alfalfa. We fed a dozen steers last winter, and realized $23.50 per ton for the hay feed.

A GOOD SLOGAN.

"We want more alfalfa, and, gentlemen, more cattle and sheep to feed it to. I would like to suggest a slogan for the community, and I take it that the Lethbridge Board of Trade would be a most fitting source for it to originate from; the slogan is 'Seventy-five per cent of our irrigated lands in alfalfa in five years.'

"This would make it possible to produce hundreds of thousands of dollars in dairy products. I say this advisedly; for it is conceded by the best authorities in Canada that it is possible to sustain one head of stock to each acre of land on a well-

tilled, fertile farm. An alfalfa raiser has an advantage that no other farmer has when it comes to dairying, for a ton of alfalfa has the same feeding value when fed to a milch cow as has a ton of bran. I fancy that neither Mr. Taylor nor Mr. Green, public spirited though they be, would care to produce bran for dairymen at $10 per ton.

"If 75 per cent of our irrigable land was in alfalfa, we could not only maintain hundreds of dairy cattle, but there would be room for farmers whose inclinations run in that line to rear many high-grade beef cattle and fancy sheep, and would also make it possible to fatten as many more range-bred cattle and sheep each winter.

ROTATING THE CROPS.

"By rotating our ordinary crops with alfalfa, a vast increase in yields would result. To illustrate this point I might cite the results obtained on the experimental station: Two years ago we established a rotation in which 60 per cent of the land is in alfalfa, ten per cent is ploughed up each year and planted with some other crop, while ten per cent of fresh-seeded land is laid down. On this rotation we raised 757 bushels of potatoes to the acre last year, and 635 bushels this year. We raised 58 bushels of wheat to the acre last year, and 59 bushels this year. By a similar rotation the yields of sugar beets in the Raymond district could be increased without question 50 per cent.

FRUIT POSSIBILITIES.

"On the small garden tracts in the close vicinity of the city rich opportunities are being neglected in the way of raising small fruits. The growing of strawberries, raspberries and currants has passed the experimental stage. I have personally raised strawberries for the last twelve years in areas of not less than one-third of an acre in any season, and during that time there was only one season in which the crop produced was not very successful from a commercial standpoint. With raspberries the crop has always been fair—usually good. With currants the crop has occasionally been light, but usually it has been good. It is needless for me to point out in connection with these small holdings the advantages the district offers to the poultry raiser in the way of an ideal climate, cheap feed and ample markets.

"Now, I have doubtless said little that you did not already know, but the people on the outside do not know. Is it not possible for us to inaugurate a campaign to exploit some of the possibilities that lie in the irrigated lands in the midst of which we live?

"Dr. Rutherford in his excellent address before you a short time ago, emphasized the fact that you as a body should lose no opportunity to aid the farmers around you in every way possible, because your interests and theirs were so interwoven. Now, it occurred to me while preparing the few remarks I have just made that there was a matter of considerable importance to the farmers hereabouts in which you might aid: I refer to fall irrigation. The farmers are coming to realize more and more each year that fall irrigation is extremely profitable; in fact, with our short season it is almost a necessity for best results. They find that it is not possible to do much at this till about October, because they cannot get their fields cleared earlier. Unfortunately, however, under the present system the company has to turn the water out about this time so as to be able to do the repairs necessary to maintain a high state of efficiency. Even then, it is only with the most strenuous efforts on their part that they are able to complete this necessary cleaning and repairing in the short time in the fall before winter sets in and early in the spring, before water is required by the farmers for their timothy meadows.

A SENSIBLE SUGGESTION.

"Now, there is a time from about August 10 till the latter part of September that crops do not require water, and, in fact, the farmer is too busy harvesting, haying and threshing to use it, that the water could be turned off. This should allow the company ample time at a period when the weather is favourable to complete their repairing. The water then could be turned on again and allowed to run till cold weather, and turned on again first thing in the spring. The only possible inconvenience the farmers might be put to would be for domestic water for their stock, and this could easily be overcome by filling their reservoirs that they use for their winter supply.

"As I understand the situation the company cannot well turn the water off during the so-called 'irrigation season' without the unanimous consent of the water users. The farmers that have talked to me about the new plan all seem to be in favour of it, if by so doing they were assured of late water in the fall and early water in the spring. The company is anxious to do anything in their power to aid the farmers, and I am sure would consent to considerable inconvenience, if necessary, provided they felt it would be of material help to the actual water users. I believe it is a very important matter. Farmers are doing considerable irrigating now, and have been for a few weeks past, and would, I believe in time do much more than they have in past seasons if the water was available later. Grass land must have early water if a good hay crop is expected.

"The irrigationists are, unfortunately, unorganized; but you are organized. Would it be too much out of your province to attempt an agitation among the farmers to bring this about? For if they were unanimous in their desire for this change I cannot help but believe that the company would be willing to meet their wishes in this regard."